

The Relationship Between Infant Feeding Methods and Smoking Behaviors in
Postpartum Women

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By

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Abstract

The purpose of this research is to increase the knowledge about the relationship of positive health behaviors and smoking relapse rates in order to improve future smoking cessation and relapse prevention interventions. This study examined the correlations between infant feeding method (breastfeed and formula feed), smoking relapse rates, and other health behaviors in the postpartum time period. The study is part of a larger, postpartum, nurse-delivered smoking cessation intervention sponsored by the Robert Wood Johnson (RWJ) Foundation. Forty-two women from the primary intervention were included in this study. Data was collected at baseline on socio-economic status, household environmental tobacco smoke (ETS) and knowledge of health-related factors surrounding smoking. Data was again collected in the postpartum time period at six months on breastfeeding status and smoking status. Fourteen women made no attempt to breastfeed and 28 women breastfed their infant for various degrees of time. The breastfeeding group was older (mean = 24.5, SD = 5.24) compared to the non-breastfeeding group (mean = 21.2, SD = 2.74) ($p=0.012$) and had more years of education (mean = 13.2, SD = 2.86) compared to the non-breastfeeding group (mean = 11.3, SD = 1.68) ($p=0.009$). The breastfeeding group was significantly less dependent on nicotine than the non-breastfeeding group, as measured by time to first cigarette ($p=0.023$). Abstinence and relapse rates were not significantly different among women who breastfed for different lengths of time. Knowledge of health-related factors, ETS conditions and abstinence and relapse rates were also not significant by different infant feeding groups. Further research is needed to explore these variables in order to find links between postpartum behaviors and relapse rates to influence positive postpartum

interventions. This is one of the few studies to investigate the relationship of women's health behaviors and infant feeding methods. Greater promotion of positive health behaviors and long-term breastfeeding of six months and more may lead to increased abstinence rates in the postpartum time period.

Introduction

Problem Statement

Smoking causes an estimated 440,000 deaths per year (CDC, 2002). It is responsible for various cancers, heart and lung diseases, and other harmful consequences. Not only are smokers harmed but also the secondary effects to others are often overlooked. Much research has been performed to examine smoking populations and smoking cessation. Twenty two percent of American women smoke (CDC, 2002). Women of reproductive years who live below the poverty level, and do not have a college education are more likely to smoke.

Compared to the adult smoking population in general, women have a higher cessation rate during pregnancy. Approximately 30% of women who smoked at conception stop during pregnancy (McBride, Curry, Lando, Pirie, Grothaus et al., 1999), while only 4% of the general population is able to quit annually (CDC, 2002). The women who continue to smoke may not receive adequate cessation interventions in the prenatal health care system (Secker-Walker, Solomon, Flynn, Skelly Mead, 1998) and may not be able to overcome the addiction, stress, and lack of motivation for cessation.

Smoking during pregnancy is harmful to the fetus and infant. It is associated with ectopic pregnancy, and spontaneous abortions (miscarriages) in utero as well as low birth weight, SIDS (Sudden Infant Death Syndrome), and lower respiratory tract infections among infants (CDC, 2002).

Pregnancy may represent a motivator to stop smoking. Women may have a larger incentive, not only to benefit their health but their baby's as well. Other factors that may

contribute to maintenance of cessation during pregnancy are social pressures, an avoidance of high-risk situations (McBride, 1999), and morning sickness.

Unfortunately, women have an extremely high smoking relapse rate after the birth of their child. Up to 60% of this group relapse within 6 months postpartum and as high as 80-90% return to smoking by 12 months post delivery (McBride, 1999). Secondhand smoke increases the risk of SIDS and lower respiratory tract infections among infants, while middle ear infections and frequency and severity of asthma episodes occur are increased in infants and children (CDC, 2002).

Relapse after delivery increases due to decreased motivation and social pressure to maintain abstinence, and increased stress in caring for a newborn (McBride, 1999). Exposure to high-risk situations that may have been avoided during pregnancy such as nightlife, bars, etc. may increase after pregnancy, triggering smoking behavior. Other factors include a return to work, fear of weight gain and cessation of breast-feeding, which may contribute to the increased relapse rates.

There is a need for programs to encourage women to stop smoking before, during, and after pregnancy. Eliminating maternal smoking may lead to a 10% reduction in all infant deaths and a 12% reduction in deaths from perinatal conditions (CDC, 2002). Perinatal women deserve a high priority because of their high motivation to quit and the potential of subsequent smoke-free years that lie ahead (CDC, 2002). Smoking cessation interventions among pregnant women are focused during the prenatal time period and minimal focus is placed on relapse prevention interventions postpartum (McBride, 1999).

Women who do stop smoking during pregnancy are concerned about their infant's health. Smoking relapse prevention may be accomplished through efforts to increase and

support positive health behaviors of the mother. Exclusive breastfeeding for 4-6 months and provision of smoke-free environments are two important recommendations to safeguard the health of newborns (Ratner et al., 1999). Studies link infant feeding methods to smoking behavior. O'Campo and group (1992) found formula feeding to be the most important predictor of early smoking relapse for both white and black women.

Purpose

A reduction of smoking relapse may be influenced through promotion of breastfeeding, and positive health behaviors among postpartum women. An increase in the knowledge of variables related to relapse and positive health behaviors may improve future smoking cessation or relapse prevention interventions.

Research Questions

1. What is the difference in knowledge of health-related effects of smoking among women who breast-feed compared to those who do not breast-feed?
2. What is the difference in exposure to other smokers in the postpartum among women who breast-feed compared to those who do not breast-feed?
3. What is the relationship between infant feeding method and relapse to smoking in the postpartum period?

Review of Literature

Prevalence

Smoking prevalence during pregnancy differs by age, race and ethnicity, education, and income (CDC, 2002). It is higher among women 18-24 years of age and lower among those 25-49 years. The most prevalent U.S. smoking populations are American Indian or Alaska Native women at 20.2%, followed by 16.2% of Caucasian

women, 9.6% of African American women, 4% of Hispanic women, and 3.1% Asian American or Pacific Islander women. Women with a higher education are significantly less likely to smoke during pregnancy. Those with 9-11 years of education represent 25.5% of pregnant smokers whereas those with 16 or more years of education represent 2.2%. Pregnant smokers who receive Medicaid benefits are 2.5 times more likely to smoke compared to those without Medicaid coverage.

Characteristics of Smoking Abstinence

In a study showing the impact of pregnancy on smoking behavior, 41% of smokers quit just before pregnancy was confirmed or at confirmation (O'Campo, Faden, Brown, Gielen, 1992). Of these same women who quit, 75% did so because of fear of adverse pregnancy outcome and infant health problems, 8% quit due to advice from family or their physician, 6% quit due to illness or nausea from smoking, and the other 11% of reasons for quitting were unreported (O'Campo, 1992). This same study compared black and white women for any significant differences in cessation and relapse. The most striking difference revealed that black women with less education were more likely to quit smoking during pregnancy (35%) compared to white women with less education (13%). In this same study, 39% of the women who successfully quit during pregnancy relapsed by 12 weeks postpartum. Of this group, women intending to breast-feed were more likely to quit during pregnancy. In addition a significantly smaller number of breast feeders relapsed compared to formula feeders. Breastfeeding in this study was found to be the only important predictor of postpartum relapse. There were no significant differences in relapse by age, education, or marital status.

Women who resume smoking are more likely to wean their babies at 26 weeks or less (Ratner, 1999). Hill and Aldag (1996) reported that smokers were more likely to wean their infants early compared to nonsmokers. Investigators in Norway found the likelihood of starting with supplements at 3 months and an increase in smoking relapse were associated (Hill, Aldag, 1996). The findings of Sayers et al. (1995) indicated that as formula supplementation increased cigarette consumption rose concurrently.

Kahn and others (2002) have shown that women who live with a smoker are 4 times more likely to relapse versus those without a smoking housemate. Low income and less education were significantly related to higher relapse rates after pregnancy (Kahn et al., 2002). Alcohol consumption and the amount of cigarettes smoked before pregnancy and pregnancy weight gain were nonsignificant factors for predicting relapse among postpartum women (Kahn et al., 2002). Ratner (2000) observed using a logistic regression analysis, that women were more likely to avoid daily smoking if they were breastfeeding at 12 months, did not have a partner who smoked, had better mental health, and were lighter users of tobacco prior to their pregnancy.

In a correlational study of postpartum smoking, significant factors of relapse were African American race/ethnicity, parity, weight gain, and stressful life events (Carmicheal, Ahluwalia, PRAMS Working group, 2000). However, unlike Ratner's findings and consistent with Kahn (2002), the amount of cigarettes smoked before cessation was not a significant factor.

Successful Smoking Relapse Interventions

The study performed by Ratner and group (2000) assigned women, in a randomized clinical trial, to receive a nurse-delivered relapse prevention intervention and home visits, or usual care. The intervention did not produce significant results, in terms of relapse prevention at 12 months. However, greater self-efficacy for smoking cessation efforts was demonstrated by intervention group participants, compared to control group participants. This increase in self-efficacy may promote greater success in future cessation efforts.

Secker-Walker and colleagues (1995) studied interventions as part of clinical care and found that face-to-face counseling during prenatal and early postpartum visits significantly deterred postpartum relapse. The intervention group in this study received usual advice from their care provider plus relapse prevention counseling. A similar study by Wall and colleagues (1995) tested an intervention with trained pediatricians providing assistance in well-baby care visits. Their results indicated a significant decrease in relapse among the intervention group. These successful interventions and outcomes exhibited that the primary health team in prenatal and pediatric care can maximize cessation rates postpartum.

Summary

A consistent finding in the reviews of relapse prevention in the early postpartum period suggests that interventions may delay, but do not prevent a return to smoking. Women who received postpartum interventions were less likely to smoke in the early postpartum as compared to those who only received prepartum assistance. However, by six months the results showed similar relapse rates (McBride et al., 1999). A need for

support of smoking cessation well beyond the early postpartum period was determined in a study performed by Ratner et al., (2000). This study provided nurse support 3 months postpartum. No significant difference in relapse rates was noted in the control and treatment group at 6 and 12 months postpartum. This study also stated that more effort is required to develop and evaluate family-centered interventions to help the mother maintain smoking abstinence (Ratner, 2000). The Edwards and Sims-Jones (1998) study indicated that interventions should include partner and family members to assist women to stop smoking. While many of the interventions have been via telephone, few seemed to incorporate women into natural social networks to support abstinence (McBride et al. 1999).

Ratner and group (1999) performed a study to examine the association between early weaning and smoking relapse. They gave specific information to the intervention group relating the effects of smoking to breastfeeding. The study found that women who resumed daily smoking were almost four times as likely to wean early compared to those who abstained or occasionally smoked. Ratner and colleagues (1999) suggested that it may be more profitable to extend the relapse prevention intervention in order to promote smoking cessation and extend duration of breastfeeding. However, there seems to be no emphasis on direct encouragement of breastfeeding in this or other studies.

Breastfeeding represents a health promotion behavior among postpartum women. More information about infant feeding methods and lifestyle behaviors may contribute to the design and implementation of successful postpartum smoking interventions in the future.

Methods

Research Questions

The purpose of this descriptive study was to characterize knowledge of health-related and environmental effects of smoking among breastfeeding and non-breastfeeding women in the postpartum period; and to examine the relationship between infant feeding method and relapse to smoking in the postpartum period. The research questions were:

1. What is the difference in knowledge of health-related effects of smoking among women who breast-feed compared to those who do not breast-feed?
2. What is the difference in exposure to other smokers in the postpartum among women who breast-feed compared to those who do not breast-feed?
3. What is the relationship between infant feeding method and relapse to smoking in the postpartum period?

Sample

The target population for this study were women recruited at The Ohio State University (OSU) Hospital delivery service. Participants 18 years of age and older who quit smoking during pregnancy between conception and 7 days prior to delivery were eligible. They were required to read and speak English. All participants were asked to give informed consent, and assured non-participation would not adversely affect their care. No exclusions regarding ethnicity, religion, socioeconomic status, psychological or behavioral conditions, or physical handicap were considered.

The OSU delivery service serves a predominately low-income population. Eighty percent of the women have Medicaid coverage or are uninsured. Estimated demographic characteristics of the participants were as follows. The participants, age: <18 years (9%),

18-30 years (73%), >30 years (18%). The sample ethnicity demographics indicated the majority of the women were White (48%), African-American (33%), Hispanic (9%), Other (9%). The maternal educational level was less than high school (30%), high school graduate (36%), some college (27%), college graduate (6%).

To achieve a power of 0.80, $\alpha = 0.05$ and a correlation coefficient of 0.30, a sample of at least 67 subjects was needed to answer the research questions (Cohen, 1988). The proposal was approved by the Biomedical Human Subject Review Committee at The Ohio State University, for the protection of human subjects.

Procedure

Participants for this study were part of a larger cessation intervention study sponsored by the Robert Wood Johnson (RWJ), Smoke-Free Families research funds (J. Groner, Principal Investigator). A research staff member determined eligibility upon delivery, women were asked smoking status prior to pregnancy, and if they quit smoking between conception and 7 days prior to delivery. Those who quit smoking were invited. Next informed consent was obtained and a saliva sample for a cotinine determination of smoke-free status was obtained from each participant (Jarvis et al., 1987).

Participants received a brief relapse prevention intervention during hospitalization and 3 visits or phone calls from a home health nurse who gave them advice on staying smoke-free. If the participant has returned to smoking, the nurse provided information on strategies to quit again.

A cognitive/behavioral intervention equivalent to the three primary recommendations of the AHRQ Tobacco Use and Dependence Clinical Practice

Guideline (Fiore et al., 2000) was employed in three or more contacts with the new mother. These included:

- 1) Encouragement to use nicotine replacement therapy
- 2) Clinician support
- 3) Behavioral and problem solving skills training

Data Collection

A member of the research staff administered the Smoke-Free Families Core Screening Form and Baseline Assessment Form in the hospital, after the delivery of the baby and before discharge. The staff member administered the questions and completed the information along with the demographics mentioned in the sample section. The following was collected: smoking history, quitting history, past number of cigarettes/day, intention to stay smoke free, confidence in remaining smoke-free, social support, partner and close relations smoking status, exposure to smoking at home, knowledge and beliefs about risks of smoking for herself and her child, medication history, perceived stress, and depression.

Research staff administered the RWJ Follow-up Questionnaire three months postpartum either by phone or a home health visit. The following topics were addressed: current smoking status, when relapse occurred, the baby's health status, and the reason why the mother remained smoke free if no relapse had occurred. In addition to these questions, breastfeeding status was obtained at 6 months, by the research staff either in the patient's home or by telephone. Forty-two women were asked if they breastfed their baby, how long had she breastfed, and if she was supplementing with formula if breastfeeding.

These instruments can be found in the appendix. The instruments were constructed by the research team and have no previously established reliability and validity estimates.

Theoretical and Operational Definitions

- 1) Knowledge of health-related effects: Side effects of smoking on the fetus, baby, and mother as measured by questions 9, 10, and 11 in the baseline questionnaire. The participant responded on a 1-4 Likert scale (1=none, 4=a lot) to the following items in the questionnaire:

How much do you think that cigarette smoking can harm an unborn child's health?

How much do you think that cigarette smoking can harm your child's health?

How much do you think cigarette smoking can harm your health?

The final item measuring knowledge included the naming of two childhood illnesses, which were associated with exposure to tobacco smoke. Correct answers included increase in respiratory problems such as asthma attacks and lower respiratory tract infections; as well as increased risk of sudden infant death syndrome (SIDS) and middle ear infections.

- 2) Breastfeeding: whether or not the woman had indeed breastfed, the duration of breastfeeding (in weeks and months), when weaning occurred, and if supplementation with formula had been provided (Ratner et al., 1999). This was operationally measured in questions 10,11,12, and 13 in the RWJ Follow-up Questionnaire at 6 months.

- 3) Exposure: number of smokers in household and close association with smokers measured by questions 13, 14, and 15 in the baseline questionnaire.
- 4) Infant feeding method was defined as formula, breastfeeding, or combination.
- 5) Relapse to smoking was smoking 1 or more cigarettes/day, for seven consecutive days (Ossip-Klein et al., 1986).
- 6) Non-smoking was 0 cigarettes/day confirmed by saliva cotinine of less than or equal to 14 mg/ml (Jarvis et al., 1987).

Statistical Analysis

Due to a small group sample size, Fisher's Exact tests were used to answer all three research questions, in order to test for significant differences of proportions between breast-feeders and non-breastfeeding mothers. Wilcoxon rank sum test and t-test were used to compare smoking behavior variables. Probability values of $p < 0.05$ were considered statistically significant.

Results

Eighty-two women answered the RWJ follow-up questionnaire at 6 months. Of these women, only 42 were available to answer questions pertaining to breastfeeding as this area of investigation was added after six-month data collection had already been initiated. Socio-demographic variables of these 42 women are displayed in Table 1. Of these 28 subjects made an attempt to breastfeed. The sample ($n=42$) had an average age of 23 years, with the breast-feeding group significantly older than non-breastfeeding group ($p=0.012$). The breast-feeding group had a trend to more likely be married or have partner status as compared to those women who did not breastfeed. Race was a nonsignificant factor in breast-feeders and non-breastfeeders, although a trend showed an

increase of White women more likely to breastfeed compared to African Americans. The breastfeeding group averaged significantly more years of education than the non-breastfeeding group (13.2 vs. 11.3; $p=0.009$).

Previous smoking behaviors before and during pregnancy are presented in Table 2. The sample averaged 16.5 years of age when they began smoking. Breast-feeders began around the age of 17.0 and the non-breastfeeding group began around 15.3 years of age; these results were not significantly different. Breast-feeders revealed slightly more attempts to stop smoking before pregnancy for at least 24 hours and at least one week. These differences although nonsignificant, revealed a trend in which breast-feeders had made more attempts to quit before pregnancy and for longer periods of time. Number of cigarettes per day, or the number of other smokers in the home did not differ by infant feeding method group.

The time to first cigarette of the day was significantly different between groups. Breast-feeders waited an average of 128.0 minutes until smoking the first cigarette, and the non-breastfeeding group averaged 58.7 minutes ($p= 0.011$). This measure is an important indicator of nicotine dependence. High dependence, as defined as time to first cigarette of the day as less than 30 minutes (Heatherton, Kozlowski, Frecker, Rickert, & Robinson, 1989) was significantly different between groups (see Table 3). The breastfeeding group had significantly more participants than the non-breastfeeding group ($p=0.023$) who were categorized in the low nicotine dependence group.

Twenty-eight postpartum mothers attempted breastfeeding their infant (see Table 4). Eleven of these women made an attempt to breastfeed for less than 1 month. Six reported breastfeeding for 1-3 months, another 6 breastfed for 3-6 months, and 5

breastfed their infant greater than 6 months. No association between relapse to smoking and length of breastfeeding was noted for those who attempted this infant feeding method. (see Table 5).

The knowledge of health-related effects of smoking between infant feeding groups did not differ (see Table 6). The breastfeeding group displayed a trend, with a higher proportion correctly naming a childhood illness ($p=0.01$) that was caused by smoking (see Table 7).

The distribution of environmental exposure to smoking conditions did not differ in the homes of breast-feeders compared to non-breastfeeders (see Table 8). No differences in relapse rates by feeding method groups were noted at 3 and 6 months postpartum (see Table 9 and 10). Further analysis revealed no association between smoking related variables and infant feeding groups with those who relapsed postpartum. Specifically, data was analyzed at 6 months on the mean age of the infant at relapse, cigarettes per day after relapse, and if the mother smoked more or less, prior to previous quit attempt.

Discussion

The purpose of this study was to increase the understanding of variables surrounding health behaviors and smoking relapse rates of postpartum women. This study was one of the few to examine breastfeeding patterns with socio-demographic variables, health-related knowledge of cigarette smoking, environmental smoking conditions, nicotine dependence, and relapse rates in the postpartum time period.

Findings from this study did not identify a relationship between breastfeeding and postpartum abstinence rates. However, the study provided important information about other factors surrounding infant feeding methods and lifestyle behaviors of the groups.

Socio-demographic variables displayed breastfeeding mothers as older, with more years of education. The increase in age of breast-feeders may have promoted maturity in the decision to breastfeed and more education possibly supported the women's decision to breastfeed because of the positive health effects to the infant and mother. A larger percentage of the breastfeeding groups were more likely to have been married or living with a partner. The breastfeeding group potentially had more social support through their spouse allowing them to devote more time to breastfeed their infant.

Both infant-feeding groups answered correctly when determining harm of smoking to themselves and their infant. However a greater proportion of breast-feeders provided two childhood illnesses related to smoking. This may indicate both groups understood cigarettes were harmful, however breast-feeders understood the degree of harm and consequences to a greater extent.

Exposure to environmental tobacco smoke (ETS) in the home was not different between groups. The mean number of cigarette smokers in the home was similar in both groups, with most homes reported as smoke free. The breastfeeding population contained more mothers who did allow smoking in their home, allowing smoking in designated areas only. Severson et al., (1997) found the number of smokers in the home and whether the mother allowed smoking, to be one of the strongest predictors of smoking in the postpartum time period. Relapse rates of those mothers who attempted to breastfeed may have been affected by their decision to allow smoking in their homes. They may

have created an environment supporting relapse due to the influence and promotion of others smoking. By creating a smoke free environment, mothers may have promoted a positive change in the right direction to remain abstinent (Severson et al., 1997). Further interventions should focus on education about the effects of ETS to the infant with the goal of creating a smoke free home atmosphere and consequently promoting abstinence.

The non-breastfeeding group had significantly higher levels of nicotine dependence compared to the breast-feeders. Research suggests that those with high levels of nicotine dependence are prone to relapse (Fiore et al., 2000). Those with a higher nicotine dependence who breastfed and relapsed in the postpartum time period may have benefited from nicotine replacement therapy (NRT), along with other abstinence strategies. This specific group displayed positive health behaviors to promote in interventions. Awareness surrounding nicotine dependence, use of NRT with breastfeeding mothers, and positive smoking cessation interventions is low among health care providers (Bonollo, Zapka, Stoddard et al., 2002). The Agency for Healthcare Research and Quality (AHRQ) encourages health care professionals (HCPs) to first promote abstinence without pharmacological treatment, however if unable to quit the potential benefits of NRT outweighs the risk of pharmacotherapy treatment and a return to smoking (Fiore et al., 2000). HCPs are advised to monitor blood nicotine levels during NRT therapy. Nicotine does pass through breast-milk; therefore NRT therapy may pose a risk to the infant. The AHRQ guideline suggests using low dosage intermittent-use products such as gum instead of the patch. The La Leche League International (2001) supports the use of NRT with breastfeeding opposed to smoking. They support the use of the transdermal nicotine patch, providing a lower level of nicotine in the blood without

the negative effects of smoke. The La Leche League advises removal of the patch at night to lower blood nicotine levels. The La Leche League advises those who use the nicotine gum to refrain from breastfeeding for 2-3 hours after use, due to the increased fluctuation of nicotine.

Further research is needed to explore a relationship between relapse rates with nicotine dependence and infant feeding methods as well as effects of NRT with breastfeeding mothers and their infants. Research would provide more information to practitioners with strategies to treat various degrees of nicotine dependence.

The relapse rate of the sample was 46.2% at 6 months. This estimate is lower than the average relapse rates of 60-75% at 6 months (Ratner et al., 2000). The relapse rate of the sample may have positively been affected by the intervention that the group received from the primary study. Although this current relapse rate was low, it would be important to note that Ratner and colleagues (2000) as well as McBride and colleagues (1999) found lower smoking rates at 6 months with their intervention group; however no difference at 12 months was found. Follow-up at 12 months with the primary study in the current project would be beneficial to determine long-term effects.

The groups studied came from a larger sample of predominately low-income status. Studies suggest that this population presents with different and greater challenges, for smoking interventions (Kendrick, Zahniser, Miller et al., 1995). Interventions to deter negative health outcomes and to help new mothers deal with the stress and changes of life after pregnancy are needed especially to high-risk groups. Due to the decreased relapse rate, the primary study may have improved cessation rates with their intervention tailored to a diverse group and low-income population. Further research is needed to investigate

and improve interventions that provide cost effective care delivery by HCPs within this population, who are often seen in clinic primary care settings.

There was no relationship between feeding method and relapse rates. A larger sample size, allowing for more women in different definitive breastfeeding standards, may have allowed for more precise interpretations of the data. The findings were inconsistent with a report from O'Campo and colleagues (1992), who found breastfeeding as the only important predictor of smoking abstinence, with a sample size of 248 women. Studies have shown that those who wean early from the breast are more likely to begin smoking again in the postpartum time period (Ratner, 1999). This may have explained the high relapse rate of the breastfeeding group when comparing the length of time spent breastfeeding the infant. Although no difference was found in the length of feeding compared to relapse rates, most women only breastfed less than 6 months. While not significant the majority of those who were breastfeeding at 6 months and longer were smoke free. Early weaning may have played a role in relapse to smoking within the breastfeeding group. Self-report data at 3 and 6 months revealed six of the participants in this group identified breastfeeding as one of the major factors in remaining smoke free. Further examination is needed on promotion of long-term breastfeeding and smoking relapse rates.

In addition the smoking variables of those who relapsed, did not support past research. The amount of cigarettes smoked after relapse did not significantly differ between infant feeding groups. Little et al., (1990) found women who breastfed and relapsed in the postpartum time period smoked less heavily than mothers who never

breastfed. A smaller sample size, definitive breast-feeding status, and variation in socio-economic status between the studies may have explained the different results obtained.

Multiple research articles have reported that HCPs have not received sufficient training to provide accurate support for smoking cessation. Education for HCPs should support the use of evidence-based interventions to provide effective treatment for postpartum mothers abstaining from cigarette smoking. Nurses play an important role of support during the postpartum time period. The hospital stay after delivery and frequent outpatient clinical visits, provide an opportunity to support breastfeeding and smoking abstinence education to mothers and family. Education must emphasize the importance of healthy decisions in this vulnerable time. Many nurses believe in their responsibility to educate patients on smoking cessation however counseling rates remain low (CDC, 1993). Through promotion of smoking cessation and breastfeeding the nurse is providing adequate support and knowledge to the patient for a healthier life for her and the baby. The AHRQ Smoking Guidelines (Fiore et al., 2000) stress that nurse participation in smoking cessation interventions significantly improve the smoking abstinence rates. Gebauer and colleagues (1998) stated that nurses must continue actively treating patients in smoking cessation due to their proven success in delivery of effective smoking cessation interventions.

Conclusion

This study emphasizes the need for further research surrounding smoking abstinence in the postpartum time period. Currently nurses and other HCPs must educate patients about the specific health related effects of cigarette smoking in detail, to increase awareness of the harmful effects to their baby and themselves. An increase in education

as well as the development of strategies to prevent environmental tobacco smoke in the home would promote a decrease in smoke exposure to mother and infant and consequently may decrease relapse in postpartum mothers. Finally, through promotion of long-term breastfeeding of 6 months, more nurses and clinicians may indirectly decrease smoking relapse rates.

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Table 1.

Socio-demographic Variables for Total Sample (n=42) and Infant Feeding Methods

| Variable | Total <i>n</i> (%) | BF ^a <i>n</i> (%) | NBF ^b <i>n</i> (%) | p-value |
|-------------------------------------|-----------------------|---------------------------------|----------------------------------|---------|
| Age, mean years (SD) | 23.5 (4.82) | 24.5 (5.24) | 21.2 (2.74) | 0.012 |
| Marital Status | | | | 0.072 |
| Married/ Living with Partner | 20 (48.8) | 17 (61.0) | 3 (23.1) | |
| Not Married/Not living with Partner | 3 (7.3) | 2 (7.0) | 1 (7.7) | |
| Widowed/Divorced/Separated | 0 | 0 | 0 | |
| Never Married | 18 (43.9) | 9 (32.0) | 9 (69.2) | |
| Race | | | | 0.086 |
| Caucasian | 19 (46.3) | 16 (57.0) | 3 (23.1) | |
| African American | 18 (43.9) | 10 (36.0) | 8 (61.5) | |
| Other | 4 (9.8) | 2 (7.0) | 2 (15.4) | |
| Education, mean years (SD) | 12.6 (2.67) | 13.2 (2.86) | 11.3 (1.68) | 0.009 |

^aBreastfeed^bNon-Breastfeed

Table 2.

Smoking Behavior Variables [mean (N) [SD]] for Total Sample and by Infant Feeding

Methods

| Variable | Total | Breastfeed | Non-Breastfeed | p-value |
|--|-----------------------|-----------------------|----------------------|--------------------|
| Previous quit attempts before pregnancy for at least 24 hours: Mean (N) [sd] | 3.1 (40) [7.97] | 4.1 (27) [9.55] | 1.2 (13) [1.57] | 0.066 ^a |
| Previous quit attempts before pregnancy for at least 1 week: Mean (N) [sd] | 1.5 (41) [3.23] | 1.9 (27) [3.83] | 0.7 (14) [1.33] | 0.092 ^a |
| Previous quit attempts during pregnancy for at least 24 hours: Mean (N) [sd] | 2.2 (41) [3.30] | 1.7 (28) [1.52] | 3.2 (13) [5.42] | 0.925 ^a |
| Previous quit attempts during pregnancy for at least 1 week: Mean (N) [sd] | 1.6 (42) [1.36] | 1.6 (28) [1.50] | 1.6 (14) [1.09] | 0.666 ^a |
| Cigarettes per day during pregnancy: Mean (N) [sd] | 10.7 (42) [9.39] | 8.7 (28) [6.69] | 14.8 (14) [12.60] | 0.301 ^a |
| Time to first cigarette of the day, minutes: Mean (N) [sd] | 104.9 (42) [151.4] | 128.0 (28) [158.9] | 58.7 (14) [128.0] | 0.011 ^a |
| Number of cigarette smokers in home: Mean (N) [sd] | 0.60 (42) [0.83] | 0.57 (28) [0.79] | 0.64 (14) [0.93] | 0.916 ^a |
| Age when first started smoking: Mean (N) [sd] | 16.5 (42) [3.02] | 17.0 (28) [3.24] | 15.3 (14) [2.20] | 0.116 ^b |

^aWilcoxon rank sum test since observations are not normally distributed

^bTwo sample t-test with equal variance for normally distributed observations

Table 3.

Nicotine Dependence Variables According to Infant Feeding Method (n=42)

| | High Dependence N (%) | Low dependence N (%) |
|----------------------------------|--------------------------|-------------------------|
| Breastfeeding | 11 (26.2) | 17 (40.5) |
| Non Breastfeeding | 11 (26.2) | 3 (7.1) |
| p-value = 0.023 | | |
| ^a Fisher's Exact Test | | |

Table 4.

Length of Breastfeeding for Total Sample (n=42)

| Variables | Number | % |
|------------|--------|------|
| No attempt | 14 | 33.3 |
| < 1 month | 11 | 26.2 |
| 1-3 months | 6 | 14.3 |
| 3-6 months | 6 | 14.3 |
| > 6 months | 5 | 11.9 |
| Total | 42 | 100 |

Table 5.

Length of Breastfeeding and Smoking Status at 6 months (n=28)

| Length of Breastfeeding | Abstinent n (%) | Relapse n (%) | Total n (%) |
|---------------------------------|--------------------|------------------|----------------|
| Less than 1 Month | 6 (37.5) | 5 (41.7) | 11 (39.3) |
| 1 to 3 Months | 4 (25.0) | 2 (16.7) | 6 (21.4) |
| 3 to 6 Months | 2 (12.5) | 4 (33.3) | 6 (21.4) |
| More than 6 Months | 4 (25.0) | 1(8.3) | 5 (17.9) |
| Total | 16 (57.1) | 12 (42.9) | 28 (100) |
| p-value = 0.513 | | | |
| ^a Fishers Exact Test | | | |

Table 6.

*Knowledge of Health-Related Effects from Smoking for Total Sample and Infant Feeding**Method (n=42)*

| Health Related Effect | Breastfeed <i>n</i> (%) | Non-Breastfeed <i>n</i> (%) | Total <i>n</i> (%) | (p-value ^a) |
|-----------------------------|----------------------------|--------------------------------|-----------------------|-------------------------|
| Knowledge of harm to self | | | | 0.999 |
| Some harm | 3 (7.1) | 1 (2.4) | 4 (9.5) | |
| A lot harm | 25 (59.5) | 13 (31.0) | 38 (90.5) | |
| Total | 28 (66.7) | 14 (33.3) | 42 (100) | |
| Knowledge of harm to fetus | | | | 0.650 |
| Some harm | 4 (9.5) | 1 (2.4) | 5 (11.9) | |
| A lot harm | 24 (57.1) | 13 (31.0) | 37 (88.1) | |
| Total | 28 (66.7) | 14 (33.3) | 42 (100) | |
| Knowledge of harm to infant | | | | 0.999 |
| Not much harm | 1 (2.4) | 0 (0) | 1 (2.4) | |
| Some harm | 1 (2.4) | 1 (2.4) | 2 (4.8) | |
| A lot harm | 26 (61.9) | 13 (30.9) | 39 (92.8) | |
| Total | 28 (66.7) | 14 (33.3) | 42 (100) | |

^aFisher's exact test

Table 7.

Knowledge of Illness of Total and Feeding Method Populations

| Named a Childhood Illness | Breastfeed <i>n</i> (%) | Non Breastfeed <i>n</i> (%) | Total <i>n</i> (%) |
|---------------------------|----------------------------|--------------------------------|-----------------------|
| Zero or One Correct (%) | 18 (43.9) | 13 (30.9) | 31 (73.8) |
| Two Correct (%) | 10 (23.8) | 1 (2.4) | 11 (26.2) |
| Total | 28 (66.7) | 14 (33.3) | 42 (100) |

p-value = 0.067

^aFisher's Exact Test

Table 8.

Proportion of Environmental Exposure Conditions in Home

| Condition | Breastfeed <i>n</i> (%) | Non Breastfeed <i>n</i> (%) | Total <i>n</i> (%) |
|---------------------------------|----------------------------|--------------------------------|-----------------------|
| No smokers in the home | 19 (45.2) | 11 (26.2) | 30 (71.4) |
| Only guests smoke in the home | 1 (2.4) | 1 (2.4) | 2 (4.8) |
| Smoke in designated areas only | 7 (16.6) | 1 (2.4) | 8 (19.0) |
| Smoke anywhere in the home | 1 (2.4) | 1 (2.4) | 2 (4.8) |
| Total | 28 (66.6) | 14 (33.4) | 42 (100) |
| p-value = 0.413 | | | |
| ^a Fishers Exact Test | | | |

Table 9.

Relapse Rate at 3 Months [N (%)]

| Feeding method | Abstinent <i>n</i> (%) | Relapse <i>n</i> (%) | Total <i>n</i> (%) |
|---------------------------------|---------------------------|-------------------------|-----------------------|
| Breastfeed and supplement | 15 (38.5) | 10 (25.6) | 25 (100) |
| Non-breastfeed | 10 (25.6) | 4 (10.3) | 14 (100) |
| Total | 25 (64.1) | 14 (35.9) | 39 (100) |
| p-value = 0.729 | | | |
| ^a Fishers Exact Test | | | |

Table 10.

Relapse Rate at 6 Months

| Feeding method | Abstinent <i>n</i> (%) | Relapse <i>n</i> (%) | Total <i>n</i> (%) |
|---------------------------------|---------------------------|-------------------------|-----------------------|
| Breastfeed and supplement | 15 (38.5) | 10 (25.6) | 25 (100) |
| Non-breastfeed | 6 (15.4) | 8 (20.5) | 14 (100) |
| Total | 21 (53.8) | 18 (46.2) | 39 (100) |
| p-value = 0.337 | | | |
| ^a Fishers Exact Test | | | |

RWJ Follow-up Questionnaire Intervention

6 months

Patient Name:

(please print)

Patient Number:

Date:

1. How would you best describe your use of cigarettes today?

- a. I quit smoking during my recent pregnancy, never started again, and am not smoking now. If this is you, skip to question 6.
- b. I quit smoking during my recent pregnancy, started smoking after my baby was born, but I have quit smoking again.
- c. I quit smoking during my recent pregnancy, started smoking again, and am still smoking now.

If you answered a to question 1, go to question 6. If you answered d or e to question 1, stop here. If you answered b or c, please continue...

2. How old was your baby when you started smoking again?

_____ (Months)

3. How many cigarettes do you smoke per day?

_____ (Per day)

4. Do you smoke:

- a. More than you smoked before you quit during pregnancy
- b. Less than you smoked before you quit during pregnancy
- c. The same as you smoked before you quit during pregnancy

5. For those who started smoking after your baby was born and then quit smoking again, how old was your baby when you quit smoking the second time?

_____ (Months)

6. Have you smoked a cigarette, even a puff, within the last 30 days?

- a. Yes (1)
- b. No (0)

7. Have you smoked a cigarette, even a puff, within the last 7 days?

- a. Yes (1)
- b. No (0)

8. Does your baby have any health problems such as
 - a. Asthma 1 Yes 0 No
 - b. Breathing Problems (other than asthma) 1 Yes 0 No
 - c. Ear Infections 1 Yes 0 No
 - c. Other _____
9. If you have not started smoking since your baby was born, why have you decided to stay smoke-free?
10. Did you and your baby receive a home visit from a nurse?
 - a. No -- You may stop here. Thank you for your help
 - b. Yes -- Please continue with next question
 - c. More than one -- please continue with the next question
11. Did you receive any phone calls from your visiting nurse after her visit?
 - a. No
 - b. One
 - c. Two
 - d. Three or more
12. Did the visiting nurse discuss smoking with you
 - a. No -- You may quit here. Thank you for your help
 - b. Yes -- Please go to next question
13. What did the nurse say about smoking (Check all that are true)
 - a. She asked if I smoke ☐
 - b. She said smoking was bad for the baby ☐
 - c. She said smoking was bad for me ☐
 - d. She said I should quit smoking ☐
 - e. She offered ways to help me quit smoking ☐
 - f. Other (please write in here). ☐

14. Did you find the nurse's visit helpful to you and your family?
 - a. No
 - b. Yes

15. What parts of the nurse visit were helpful?
 - a. Discussion about baby care
 - b. Discussion about self care
 - c. Discussion about safety
 - d. Discussion about smoking
 - e. Other (What)?
16. Were any parts of the nurse's visit a problem or annoying to you?
 - a. No
 - b. Yes (what)?
17. If the nurse talked to you about smoking, how did you feel about it?
 - a. I was glad she talked about it
 - b. I felt guilty when she talked about it
 - c. I was angry when she talked about it
 - d. Other
18. Do you think visiting nurses should try to help people quit smoking?
 - a. No
 - b. Yes
19. Do you have any ideas about what visiting nurses can do to help people quit smoking?

Please tell us your ideas
20. Did you attempt to breastfeed your baby?
 - a. Yes
 - b. No
21. If yes, how long did you breastfeed your baby?
 - a. Less than 1 month, ____ days
 - b. 1-3 months
 - c. 3-6 months
 - d. more than 6 months
22. If you did breastfeed your baby, did you also supplement with a bottle?
 - a. Yes
 - b. No
23. How often did you supplement with a bottle?
 - a. Once a day or less
 - b. 2-3 times a day
 - c. 4 or more times a day

